

The messy interplay between forces of resistance and forces for change in territorial transitions: A case study of an Alpine ski resort

Aida Arik^{1*}, Emmanuelle George¹

¹Univ. Grenoble Alpes, INRAE, LESSEM, Grenoble, France

*aida.arik@inrae.fr

Abstract

Winter tourism and its associated development has reshaped mountain communities of France and established itself as a major economic engine at a micro and macro scale. However, ski resorts built around this economic model are facing an increasingly uncertain snow future, especially at mid-mountain altitudes. In this paper, we examine the case of a mid-mountain community in the Alps that initiated a collaborative planning effort to decide the fate of their loss-generating ski lift equipment. This case illustrates that climate change adaptation is not a mere question of pecuniary or normative decisions. Rather, to better understand the forces at play, we take a territorial transitions approach to examine the multi-scalar inertial forces in the material, institutional, and ideal dimensions of this community.

Keywords: winter tourism, climate change, territorial transitions, French Alps, mid-mountain ski resort

1. Introduction

Fluid mechanics provides an apt analogy for what many territories are facing in terms of direct and indirect impacts of anthropogenic global warming—it defines three flow phases: laminar, turbulent, and transitional. Laminar flow mirrors harmonious territorial operations, turbulent flow represents chaotic and unpredictable disruptions of territorial systems, and transitional flow reflects territorial systems between the former two regimes, oscillating between stability and instability. In this paper, we focus on the French Alps, which exemplify a transitional “flow” (territorial) phase. In France—a country facing average temperatures increases greater than Europe and the world, on average (FAO, 2023)—areas at greater altitude are facing even faster warming than those at lower altitudes (Adler et al., 2023). Thus, the mountains of France are seeing decreasing snowpacks, especially at mid-altitudes, and increasing uncertain snow regimes (Dayon et al., 2018; Gerbaux et al., 2020). This poses an existential problem in many communities whose economies were built around ski resort tourism (Spandre et al., 2019; Steiger et al., 2019; François et al., 2023; Berard-Chenu, Métral and Cognard, 2024; Bonanomi et al., 2024).

For better or for worse, these mountain communities offer an opportunity to gain important lessons for areas around the world that are facing economic transitions as a direct or indirect impact of climate change. In an essay about declining tourism prospects due to increasingly uncertain snowpack of mountain territories built around ski resort tourism, Bourdeau (2009) describes the French Alps as a “laboratory of post-tourism experimentation.” The author hypothesises that with climate change, mountains could return to a pre-ski development model of the mountain is the summer vacation destination of the coming decades, supporting this hypothesis through evidence of growing residential transition of mountain tourist areas, lifestyles that support more place-based activities, and a declining interest in long-distance travel (Bourdeau, 2012). Whereas this represents a rather radical interpretation of the tourism and population signals in mountain territories, it does however represent one bookend scenario of possible futures for individual ski resort villages among a plethora of possible trajectories based on climate, economic, and cultural forces. For the ski resort villages most impacted by these exogenous forces, there is a clear role for planning in directing these territories through their transitional phase towards stability (laminar) and away from instability (turbulent).

Post-modern planning has produced a fractalized landscape of many normative (post-positivist) theories (Allmendinger, 2002). In its essence, normativity in planning is driven by what we should do because it's the right thing to do for the future (Healey, 2003), although there are many arguments to be made around the meanings hidden behind each loaded word. In contemporary times, we have an unequivocal global consensus based on

decades of research that indicates that we should adapt to climate change impacts because it is the right thing to do for the future (IPCC, 2023). Yet, we also have ample evidence that, on a global scale, governments are not meeting the pace and scale of adaptation needs (Berrang-Ford et al., 2021). Zooming into the local-level, there may be a plethora of valid reasons (Rittel and Webber, 1973) why climate adaptation measures are difficult to implement, inadequate, or ineffective (including important cultural, psychological, and political reasons). Nonetheless, it raises the question of whether our current planning paradigms are equipped to address contemporary challenges effectively, both in terms of scale and pace, to find stability with future climate regimes. Indeed, Pavoni et al. (2024, p. 1) pose a critically relevant question to planners: “What if the problem with planning was its very relation with normativity and future?” Indeed, planning is challenged by the very nature of adaptation, which cannot be confined to frameworks and requires a constant process of learning and adjustment.

While there are many strands of post-positivist planning theories, collaborative planning remains a dominant theory in post-modern planning (Tewdwr-Jones and Allmendinger, 2002). In this paper, we aim to take a closer look at the collaborative planning processes relation with normativity and the future to understand some of the tangible and less tangible elements that constrain outcomes (i.e., non-transformative planning efforts that do not seem to meet climate adaptation needs). Pavoni et al. (2024) interrogate these notions of normativity and the future, suggesting planning “not as a strategy to act in the present in order to build a different future, but rather as a strategy to release in the present those futural presences...that are already there.” Our goal of this paper is to examine how collaborative planning can be used to help release a territory from its inertial forces that transcend our abstractions of the future, and at the same time manage transitions without necessarily transforming all outputs.

In this paper, we consider a collaborative planning process taking place in the Chartreuse Mountains of the French Alps. La Montagne Autrement 2030, is a local effort focused on the ski resort village of Saint-Pierre-de-Chartreuse (SPC) concentrating on an imminent and divisive decision facing the community on what to do with their ski lift equipment. We aim to take a closer look at the tangible and less tangible elements that can constrain territorial transitions and the role of the collaborative planning effort.

2. Background

2.1. *Setting the scene: the rise of winter tourism in France*

It is no coincidence that the growth of winter sports tourism corresponds to the mechanisation and motorising of snow removal equipment in the wake of the world wars, but the idea and allure of ski sports was slowly being developed and implanted into the imaginaries well before. In France, we can trace some of the major factors that contributed to the rise of ski tourism and the eventual widespread establishment of ski resorts across high altitude spaces (Figure 1). With the establishment of the first ski clubs at the end of the 19th century and beginning of the 20th century, the Alps played a major role in the rise of ski in France and the eventual establishment of the first generation of ski resorts. During WWII under the Vichy Regime, mountains were used as a ‘tool’ for the masculinisation of young boys under an educational philosophy emphasising physical fitness and outdoor training, again with a focus on the Alps. Following the war, populations movements towards economic opportunity led to a trend of rural flight and decline in agriculture that impacted mountain territories.

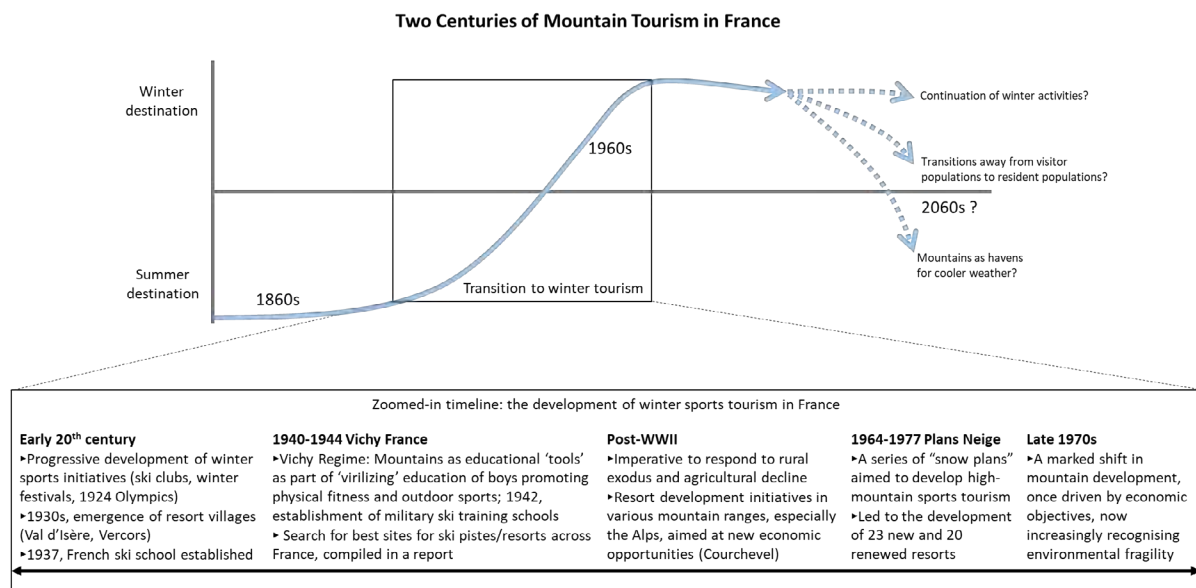


Figure 1. The shift of mountains in France from summer destinations to winter destinations was driven by the alignment of many events over the course of nearly a century. Ski and winter tourism remains important to the economy and culture in France. However, despite the strong heritage of ski resort development, the future of winter tourism is becoming increasingly uncertain with climate change. The future of individual ski resorts is contextual, with some ski resorts continuing investments in ski tourism with success, while others are phasing out ski.

In recognising the potential of winter tourism as a means to boost the economy in these mountain territories, the French government began identifying locations favourable to skiing and investing in infrastructure, leading to the so-called second generation of ski resorts similar to Courchevel (Cumin, 1974). The continuing rise in the popularity of skiing, its marketing, continued technological improvements of ski infrastructure and the profitability of the ski resorts eventually set the stage for the emergence of the Plans Neige by the French government and the emergence of a third generation of ski resorts. These were a series of "Snow Plans" starting in 1964 that outlined widescale development of purpose-built ski resorts, called integrated resorts often built ex-nihilo with the developer playing a major role (Perret, 1992). Between 1964 and 1977, the Plans Neige led to the wide-scale development of many new ski resorts and the renewal existing resorts. By the late 1970s, the development frenzy driven by the Plans Neige was waning, as the initial motives—curbing rural exodus and boosting mountain economies—were challenged by new concerns. Ski resort expansion faced growing criticism, not only for its environmental impacts from unbridled urban planning and enormous accommodation capacities but also from external actors who promoted efforts to restore local control and create more balanced development. Land was increasingly designated for protection through National Parks, in attempting to counterpoise tourism-driven economic growth with environmental safeguards. Nevertheless, ski resort development continued into the end of the 20th century even if at a slower clip.

2.2. The writing "in the snow"

The imprint of ski and winter mountain tourism since its accession in the mid-20th century remains strong. However, across France, as well as Europe and in many places around the world, ski resorts with winter sports-based economies are facing existential questions about their future with an increasingly uncertain snowpack (Steiger et al., 2019; François et al., 2023; Dumont et al., 2025). While many ski resorts use snowmaking and snow grooming to ensure continuous operations in spite of decreasing snow conditions (Damm, Köberl and Prettenhaler, 2014; Schlegel and Schuck, 2024), there are many questions about its continued function as climate change impacts continue to amplify (Spandre et al., 2019; Berard-Chenu et al., 2021; Morin et al., 2023; Scott, Knowles and Steiger,

2024). Indeed, without snowmaking, François et al. (2023) estimate that with 4°C warming, 98% of ski resorts across 28 European countries are at a very high risk for snow supply. Whereas, the number drops to 71% with snowmaking, but raises very serious questions about its contribution to the vicious cycle of electricity and water demand, carbon footprint, and further contributions to local impacts and global warming, by becoming maladaptive strategies.

With the recognition that the French ski business model is becoming increasingly financially and environmentally unsustainable for many ski resorts (Cour de comptes, 2024), questions emerge about the future of these mountain spaces. Diversification has long been and continues to be a strategy for shifting away from a dependence on winter sports tourism, especially for mid-mountain ski resorts that are on the frontlines of global warming impacts (Achin, 2015; Rouch, George and Rieutort, 2022; Steiger et al., 2024). However, in the process of moving away from a solely ski-based economy, it is important in the planning of such transitions to consider the wider territory and not just the ski resort concerned (Achin and George-Marcelpoil, 2013), as well as other socio-cultural forces beyond tourism that play a role in reshaping these territories in transition (Bourdeau, 2012, 2021).

3. Methodological Notes

3.1. Defining territorial transitions

Taking a broad historical view of a territory allows us to trace major transitions and the forces that shaped them, as seen in the rise of winter tourism in France. However, when it comes to adapting to climate change, the past not only sets constraints on future possibilities but also interacts with dynamic factors that shape the range of viable solutions (Haasnoot et al., 2020). This is referred to as “path-dependency,” which helps understand the possible range of strategies for addressing climate change for a given context. Within path dependency, there may be instances of adaptation inaction or maladaptation that create “lock-in.” Lock-in describes how rules, land-use patterns, and infrastructure can lock a system into a trajectory that is costly to change (Abel et al., 2011). When certain actions are implemented on top of existing structures or an adaptation opportunity is missed, it is not only potentially locked in for its lifecycle, but the surrounding values, knowledge, and institutions tend to continue to uphold and reproduce that trajectory (Meynard et al., 2018). In a similar vein to collaborative planning, Garrelts and Lange (2011) propose that process-oriented bottom-up approaches can help tackle the spatial and temporal complexities among diverse actors posed by path dependency.

However, climate change adaptation is in many ways fundamentally different from adapting to climate impacts on winter sports tourism, where the existential threat from climate impacts is imposed on an economy from which a space is built rather than the space on which the economy depends, for the former. Thus, in planning for futures of ski-reliant communities, we are particularly concerned with creating pathways for social and economic sustainability (Gill and Williams, 2018). To clarify the meaning behind the word ‘territory,’ we adopt the approach as defined by Pachoud, Koop and George (2022). The authors explain the concept of the territoire rooted in French geography (Lajarge and Sadoux, 2023) as an interaction between its material, institutional, and ideal dimensions, which serves as a framework for understanding how human activities shape and are shaped by multi-scalar contexts. The authors argue that although geography scholars tend to use the concept to understand dynamics of a territory over short time spans, the concept can also be used to understand potential pathways toward sustainability. The three dimensions can thus help us understand the dynamic nature of the territory: the material, which includes all physical human and non-human elements like resources, infrastructure, and land use; the institutional dimension, which encompasses the formal and informal structures of governance whose role is to organise and manage space while balancing social interests; and the ideal dimension that reflects the cultural, emotional, and social values ascribed to a space by its inhabitants (ibid).

In this paper, we explore the question of inertial forces in the territory that act to either resist or direct change. Mahoney (2000) describes social inertia as processes that are set into motion towards a particular outcome that stay in motion and continue to track that outcome. Some explain the persistence of social structures in terms of reproduction, in that institutions reproduce themselves over time for social stability, causing self-reinforcement that resists directional changes, even if the status quo is unsuitable for the present or future (Barnett et

al., 2015; Brulle and Norgaard, 2019). There are a number of case studies in the literature that name inertia as an impediment to adaptation action, especially related to the persistence of modernist engineering approaches in institutional cultures and development regimes of territories (Harries and Penning-Rowsell, 2011; Taylor, 2016; Meng et al., 2022; Robert, Quercy and Schleyer-Lindenmann, 2023). For this paper, we are particularly interested in the framework laid out by Munck af Rosenschöld, Rozema and Frye-Levine (2014) that connects the concept of inertia to new intuitionist literature, which we will describe further in Section 3.3.

3.2. Where does “economics” fit in?

Hagimont (2020) describes the case of the development of tourism in the French Pyrénées with the onset of ski tourism to illustrate, on the one hand, the commodification of the human-nature relationship, and on the other hand, the disconnection of all that is less desirable in such a relationship (as rural life in the mountains at the turn of the 20th century was a hard living). The early successes of ski tourism set the stage for viewing mountain territories as areas that could be planned, controlled, and commodified, and no doubt contributed to solidifying the imaginaries supportive of the planification of mountain territories for ski tourism in the mid-20th century via the Plans Neige. Indeed, with the building of transport infrastructure and mechanised snow management equipment, the very relationship with snow for mountain residents radically transformed for many mountain residents from an encumbrance to a potential source of revenue. The heritage of the Plans Neige has ensured France as a major international ski destination (2nd to the United States) with mountain tourism accounting for more than 20% of the overnights stays even as visitor numbers have been in the decline for the past decade (Cour de comptes, 2024).

In contrast, Vindevoghel (2024) describes a 21st century view of rural mountain areas of France providing a key opportunity for reconnecting the human-nature relationship towards sustainable transitions in order to move past the legacy created by the Plans Neige. However, the commodification of snow for now is still a major economic mechanism for many mountain communities. Complicating matters further, France has a specific system of ski area governance. Unlike many countries, which have fully or mostly privately operated and managed ski resorts, France considers ski lifts a form of public service. As a result, local authorities with ski areas choose to either manage their own ski area or delegate management to a private entity via a process known as a public service delegation (Cour de comptes, 2024). Therefore, local authorities may be eligible for subsidies under public policy schemes regardless of their size or financial viability. Public funding for tourist activities shifts costs from users to taxpayers, raising legal concerns about financing public industrial services, financial risks for authorities if businesses fail, and questions about the appropriateness of public spending (ibid).

France’s model of treating ski lift equipment as public service infrastructure, necessitates decision-making across the material, institutional, and ideal dimensions. For example, a private owner and operator of ski lift equipment might prioritize operational decisions based primarily on demand and return on investment—keeping decision-making largely within the material dimension—as is the case in the North American ski resorts (Knowles, 2019). Ski lift equipment as public infrastructure introduces additional institutional and societal considerations that shape governance beyond pure market forces. Where market forces play a downsized role, institutional and ideal dimensions can play a large role in driving decisions about the future of ski lift equipment. Thus, planning for the future of French ski resort towns better fits under the framework of new institutional economics and understanding the associated transaction costs of planning (Shahab, 2022). As Alexander (1992) explains, economic and political markets they represent an aggregate of self-interested decisions; however, interorganisational systems need planning because transaction costs are inherently high.

3.3. Evaluating territorial inertia

Since market decisions are not the key decision-making mechanism for French ski resorts, understanding inertial forces can a useful guide to planning, especially where there is not concrete objective. Munck af Rosenschöld, Rozema and Frye-Levine (2014) offer a framework pulling from new institutional literature to understand institutional inertia and climate change policy implications. The authors define five mechanisms producing institutional inertia: costs, uncertainty, path dependence, power, and legitimacy. In this paper, we examine how inertia

presents itself in the case of a ski resort village. We first make the case that the decision for the future of the ski lift equipment is not solely a cost-benefit ratio decision. We describe a collaborative planning process under-way that enables collective decision-making over the future of the ski lift equipment and, beyond that, how the community wishes to define the future habitability of their village. We use the framework outlined in Table 1 to evaluate inertia, with collaborative planning as a strategy to mitigate inertial forces.

Table 1. Five mechanisms of institutional inertia and collaborative as a potential strategy to address them.
Adapted from Munck af Rosenschöld, Rozema and Frye-Levine (2014).

Inertia generating mechanism	Collaborative planning strategy
Costs - coordination expenses and other transaction costs that can be less visible but discourage action	Although coordination expenses may increase in the short-term, shared resources can reduce overall transaction costs and coordinated efforts can reduce long-term monetary costs.
Uncertainty - incomplete information that rationalises post-ponement of action	Bringing diverse stakeholders together allows for a broader exchange of knowledge, making risks clearer and alleviating hesitation to action.
Path dependence - self-reinforcing mechanisms that lock institutions into past decisions, technological systems, practices, and discursive frameworks, making change difficult despite evolving challenges	Collaborative planning enables institutions to assess and challenge entrenched practices, opening pathways for innovation and reducing reliance on outdated systems or practices.
Power - embedded in social structures, relationships, and discursive frameworks that reinforce institutional arrangements, making resistance to change a result of entrenched interests rather than rational calculations	As multi-stakeholder processes, collaborative planning can challenge dominant interests that resist change and create momentum for more equitable strategies.
Legitimacy - institutional norms and power structures determine which climate policies are accepted or resisted, often reinforcing existing economic and political interests instead of driving meaningful change	Consensus-driven approaches build trust and reinforce the legitimacy of climate policies, ensuring they are widely accepted and implemented rather than dismissed or blocked by political or economic interests.

These mechanisms of territorial inertia either reinforce resistance to change, favouring the status quo, or can diminish in favour of transitioning to a changed state. This dynamic can be expressed as:

$$I_{\text{status quo}} > I_{\text{change}}$$

Where represents the sum of inertial forces. For a territorial transition to occur, inertial forces must reach a critical mass¹, leading to a directional inversion toward change:

$$I_{\text{status quo}} < I_{\text{change}}$$

At this threshold, transition becomes the favoured course of action, where there is no longer enough resistance to maintain the territorial status quo. However, as long as the path dependency, power, and legitimacy are each greater in the status quo than that of the potential changed state, and conversely, if the costs and uncertainty in the status quo are each less than that of a changed state, the status quo is favoured. The inertial forces within the same territorial state can accordingly be represented as the sum of costs (C), uncertainty (U), path dependency (D), power (P), and legitimacy (L):

¹ Territorial changes may unfold over years or decades. For example, in the case of the transition of mountain areas in France transitioning from summer to winter destination (Figure 1), there was an amalgamation of many events that led to this over-all transition.

$$I = D + P + L - C - U$$

Applying this framework can help identify forces that may be contributing to the territorial resistance to change, even where transition would otherwise, from an outsider's perspective, be the logical course of action.

4. Case Study

4.1. Research context: Saint-Pierre-de-Chartreuse/Le Planolet

Located in the Alps of Southeastern France, Saint-Pierre-de-Chartreuse-Le Planolet (SPC) is a mid-mountain ski resort community with a population of less than 1000 residents (INSEE, 2023). SPC is located in the Chartreuse Mountains about 25 km north of the City of Grenoble and about 35 km south of Chambéry. As with many ski communities in France, SPC started to develop in the early 20th century and became a ski resort village in the 1950s, with major re-investments in the 1980s and 90s. The area features 26 trails covering 35 km, served by 14 ski lifts and three access points, with altitudes ranging from 900m to 1789m at the Scia summit. As a mid-sized resort with a capacity of nearly 3,000 persons per kilometre per hour, it caters to both families and seasoned skiers.

However, several metrics indicate a delicate financial situation. Over the past 15 years (2015-2023), the ski resort attained an average annual revenue of €1.4 million, with a peak of €2 million during the particularly snowy winter of 2008-09. Between 2015 and 2020, it recorded an average of 130,000 skier-days per season, while the domain was operational for an average of 73 days per year. Despite these figures, the resort faces a negative operating ledger, burdened by €2 million in loan repayments, worsened by an aging lift system with high maintenance costs and an oversized fleet compared to similar resorts (Chambre régionale des comptes, 2023).

Furthermore, regional plans create a contradictory structure for economic diversification in the face of climate change. SPC is located within the Auvergne-Rhône-Alpes administrative region (AURA), which provides oversight and planning for the broader regional area in coordination with local entities. Climate change adaptation efforts in the AURA region overwhelmingly prioritise snow security and winter activity safety, with nearly three-quarters of its funding commitments directed toward maintaining ski resort viability rather than diversifying tourism options. For instance, the Region's Mountain Plan (2016-2021) allocates €49.8 million for snow security and €4.5 million for tourism diversification. Similarly, while the Tourism Plan emphasises diversification, its focus on valley areas where there is one or more resorts means that a majority of its budget goes towards ski resorts. Given the high costs of ski infrastructure maintenance, it is reasonable that a significant portion of the budget is allocated to its upkeep; however, this continued investment reinforces a persistent focus on traditional winter tourism (i.e., reinforces path dependency) rather than broader adaptation strategies (Chambre régionale des comptes, 2024).

The SPC ski resort has long struggled to establish stability, with some investments proving unsuitable for the station's scale and capabilities. The municipality of SPC is one of 17 that make up the Communauté de communes Cœur de Chartreuse (CCCC), an intercommunal federation of municipalities. Over the past 20 years, the ski area's management has shifted between local authorities, joint public operations, and private operators, testing various governance models before returning to control under the CCCC in 2023. In fact, the Regional Chamber of Accounts for AURA conducted an audit of the management of the Saint-Pierre de Chartreuse-Planolet ski area syndicate for the period 2009 to 2014 (before the CCCC took oversight) (Chambre régionale des comptes, 2016). According to the report, the financial situation of the SPC ski area syndicate at the time was already exceedingly precarious, with debt levels exceeding 18 years of gross self-financing capacity and making it nearly impossible to secure loans for necessary future upgrades and maintenance of its outdated infrastructure. These financial difficulties had already emerged during the previous syndicate's management of the ski area, ultimately leading to its dissolution and the transfer of authority to the CCCC.

Although five ski lifts are currently not in service, they still impose financial obligations due to ongoing loan and insurance costs. However, restoring them to operational status and ensuring compliance with regulations comes

with a hefty price tag (Table 2). While management by the CCCC enables a broader territorial view², they lack the financial resources to support the ski lift deficits of SPC and has yet to devise a clear plan for either adapting or ending operations. Today, the local community has embraced a collective planning effort to confront their climate realities and economic pressures linked to the uncertainty of ski operations. This case highlights the co-existence—and at times, strong opposition—between forces of resistance to change and transformation, while demonstrating the importance of collective planning in reshaping actors' imaginaries about transitions before implementing conflict-minimizing adaptive actions.

Table 2. Out-of-commission ski lifts in the SPC ski area and their associated situations (figures presented at a public meeting in Saint-Pierre-de-Chartreuse, 6 December 2024).

Ski lift	Current situation	Re-commissioning costs and procedures
Scia chairlift	• Not in use since March 2020 • Suspension of operation • Safety order, March 2026	Estimated re-commissioning costs at €350,000
Essarts gondola lift	• Not in use since March 2020 • Suspension of operation • Safety order, March 2025	Estimated re-commissioning costs at €820,000 (without an update of equipment)
Fraisses chairlift	• Not in use since March 2020	At least the major inspections order of 2022 and 2023 need to be implemented
Combe de l'Ours chairlift	• Not in use since February 2023 • Major inspections order over 3 years: phase 1 completed in 2022, phases 2 and 3 incomplete	For a return to service: completion of inspections order, compliance audit, and tower diagnostics. Remaining cost of order and re-commissioning estimated at over €400,000

4.2. A collaborative planning effort (La Montagne Autrement 2030)

The Montagne Autrement 2030 initiative, spearheaded by local authorities including the CCCC and the municipalities of SPC and Saint-Pierre-d'Entremont (SPE), has provided a platform for reflecting on the future of the ski domain amid the challenging context outlined in section 4.1. This collaborative initiative stands out as a distinctive and exemplary approach to territorial transitioning, conceived in response to the financial difficulties of the SPC ski domain and the declining snowfall at mid-altitude. A bottom-up effort in 2020 debuted this effort, which has brought together various stakeholders—including local public actors, residents, business owners, and economic actors—to discuss not only the future of the ski area but also the broader evolution of the local tourism offering. Through sustained dialogue, this diverse coalition of participants has explored ways to shape a tourism model that aligns with emerging challenges and opportunities (Figure 2). As part of this effort, the EU-funded Interreg TranStat project (Transitions to Sustainable Ski Tourism in the Alps of Tomorrow)³ designated SPC as a 'Living Lab,' actively exploring innovative strategies in climate adaptation and sustainable tourism, where the project seeks to promote new models of Alpine development and transition in the face of changing climate. The TranStat project aims to helping provide the collaborative effort with information about economic realities, environmental concerns, and evolving visitor expectations.

² In the CCCC territory, there are a range of Alpine and Nordic resorts, several of which are managed by associations through delegated management or private operators (e.g., Le Granier, Les Egaux).

³ <https://www.alpine-space.eu/project/transtat/>

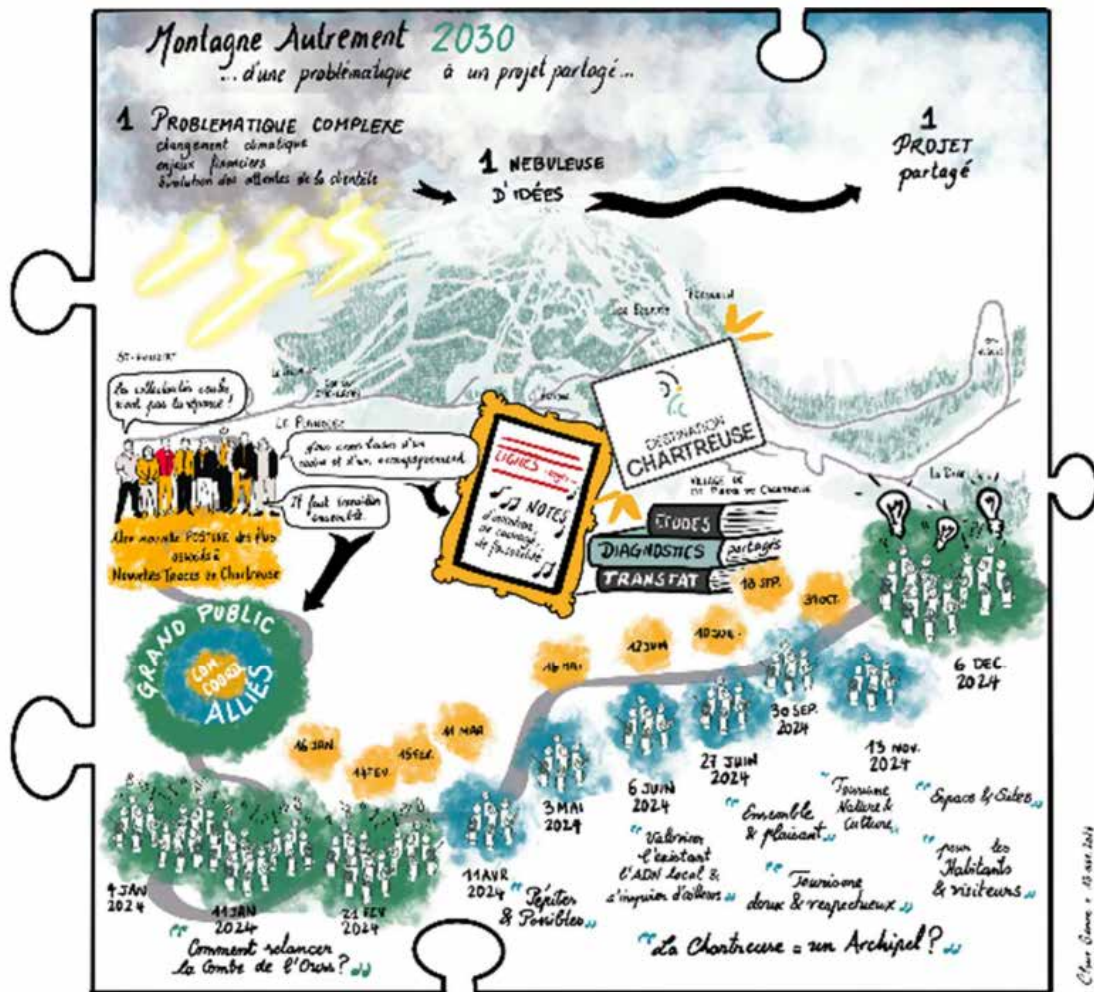


Figure 2. A facilitator-artist's rendering of the collaborative planning process, La Montagne Autrement 2030. Illustration by Claire Simon.

This collaborative process ultimately led to a scaled-down ski domain, now managed by two separate entities under public service delegations, marking a pivotal shift in the governance model. The association Nouvelles Traces en Chartreuse has taken charge of five ski lifts in Le Planiolet sector, while the private operator Stass' manages five lifts in the Essarts sector, both under five-year agreements. The decision not to reopen the chairlifts and cable car was driven by financial constraints, as the costs of inspections and refurbishment far exceeded available funding. However, the CCCC has now commissioned a feasibility study to explore the sale and dismantling of these lifts, aiming to ease financial strain and ensure long-term economic viability. This transition reflects a broader shift toward a four-season tourism model, prioritising sustainability, cost reduction, and adaptability. The ongoing debate among stakeholders—between those who view the closures as an opportunity to innovate and those who struggle to let go of the past—illustrates the deep emotional attachment to traditional ski operations, requiring a transformation of imaginaries to embrace new possibilities.

Beyond infrastructure adjustments, the Chartreuse region has embarked on a broader ecological transition, seeking to redefine its tourism identity amid climate uncertainty. This vision-building effort is exemplified by the Chartreuse à +4°C initiative, launched building on the work of the TranStat project and La Montagne Autrement 2030, which brings together scientists, policymakers, and local residents to collectively reimagine life in the mountain territory under a +4°C scenario. A participatory event held in 2025, fostered discussions on

adaptation strategies, exploring alternative economic models, environmental conservation efforts, and the future of mountain landscapes through design fiction workshops. These efforts reflect an intentional shift toward integrating local knowledge, science, and community engagement, ensuring that transitions are inclusive and forward-thinking rather than reactive. The transformation of actors' imaginaries—encouraging stakeholders to visualise new futures beyond the reality of today—is crucial to building a resilient, adaptive Chartreuse, where tourism can flourish year-round while preserving both economic stability and ecological integrity.

4.3. Beyond the numbers: the 'invisible' costs of adaptation

Taking a simplified view of the situation in Saint-Pierre-de-Chartreuse (SPC), focusing primarily on financial considerations. The real monetary costs of maintaining the status quo—keeping the ski lift equipment non-operational—are significantly higher than dismantling and selling the infrastructure. Likewise, recommissioning the lifts would not provide a long-term return on investment, yet some stakeholders still advocate for reopening them. If we consider only financial aspects, the logical course of action would be dismantling and selling the ski equipment, as such:

$$C_{\text{recommission}} \gg C_{\text{status quo}} \gg C_{\text{decommission}}$$

However, since this decision has not yet been made, other inertial forces—beyond costs—are clearly influencing the continuation of the status quo. In terms of status quo (SQ) versus change (Ch), this suggests (building on section 3.3):

$$I_{\text{SQ}} + C_{\text{SQ}} > I_{\text{Ch}} + C_{\text{SQ}}$$

Or:

$$(D_{\text{SQ}} + P_{\text{SQ}} + L_{\text{SQ}} - U_{\text{SQ}}) > (D_{\text{Ch}} + P_{\text{Ch}} + L_{\text{Ch}} - U_{\text{Ch}}) - \underbrace{(C_{\text{Ch}} - C_{\text{SQ}})}_{\text{net positive}}$$

Since $C_{\text{SQ}} - C_{\text{Ch}}$ is net positive, given that dismantling and selling the ski lifts is the least cost-depleting option, financial logic alone would dictate their removal. However, the decision remains unresolved, suggesting that other forces in the status quo (left-hand side) have a greater overall value. It should be recognised that the costs associated with the ski equipment represent the most significant tangible financial burden compared to other expenses borne by various local actors. However, additional costs also play a role, such as the time and resources invested in the collaborative planning efforts, which require coordination across multiple stakeholders. Furthermore, decisions about the ski lifts have a cascading effect, influencing economic structures that still rely on these assets in various ways. While these inertial forces related to institutional and individual actors could be examined as well, the focus here remains on how broader financial and socio-economic dynamics shape decision-making within the territory.

Beyond financial constraints, uncertainty is a key factor, closely tied to the future climate and socio-economic scenarios. The TranStat project seeks to reduce these uncertainties, offering knowledge on climate impacts and socio-economic implications of different pathways. Similarly, publicly provided cost data helps mitigate financial uncertainties, offering stakeholders greater clarity. Legitimacy, in turn, is tied to uncertainty—the status quo is familiar, making it inherently legitimate. The collaborative planning effort and the transparent dissemination of information serve to enhance legitimacy, a crucial factor in securing socio-institutional support for transition. In SPC, this process has been bottom-up, placing the decision of legitimacy in the hands of the public, rather than solely policymakers. This also connects to power dynamics. By fostering a bottom-up decision-making model, local leadership acknowledges the role of legitimacy in community-led planning while also distributing power among local actors. In contrast, other ski resorts may experience heavy lobbying pressures, which do not seem prevalent in SPC. Historically, initiatives like the *Plans Neige* followed a top-down model, where State power was used to push through ski resort development. Finally, path dependency plays a significant role in shaping this process. The legacy of the ski domain—its historical role, socio-economic ties, and ingrained expectations—con-

tinues to exert influence, reinforcing resistance to change even when economic logic suggests otherwise. Even still, the Chartreuse à +4° demonstrated that ski does not have a strong presence, if any, in the residents' long-term vision of the habitability of their community.

5. Concluding Remarks: Inertial Forces as an Impediment to Transitions

The evolution of mountain territories has long been shaped by the collective imaginary built around ski resorts and their associated economies, a legacy reinforced by decades of investment and infrastructure planning. However, as financial difficulties, shifting environmental conditions, and uncertain transition models challenge the future viability of these ski domains, the question of territorial inertia becomes central to understanding the pace and feasibility of change. Factors such as economic debt, social ties, and environmental impact contribute to this inertia, making transitions complex and slow-moving. The key to facilitating successful planning efforts lies in identifying critical moments along the trajectory of these stations—moments where intervention could have the greatest impact in overcoming inertia and steering toward a more sustainable model. Without this strategic foresight, planning efforts risk being reactive rather than proactive, limiting their chances of meaningful success.

The interplay between transaction costs and local imaginaries further illustrates why change remains contested. In Saint-Pierre-de-Chartreuse, for instance, the financial burden of maintaining non-operational ski lifts outweighs the cost of dismantling them, yet this purely economic reasoning does not dictate outcomes. Instead, the cultural and emotional significance of the ski infrastructure continues to carry as much weight as structured planning efforts, leading some to describe this phase as a grieving period rather than a transition. While perceived transaction costs often constrain change, cases like Chartreuse à +4°C reveal that when residents are freed from immediate financial concerns and encouraged to imagine the future without real-world limitations, they engage with transition more fluidly. These two collaborative efforts highlight a broader truth: successful adaptation requires both pragmatic planning and a transformation of collective imaginaries embedded in territorial transitions. Moving beyond incremental shifts, communities must consider what timescales allow transitions to occur without being stalled by inertia yet remain tangible enough to be actionable within present-day realities.

Acknowledgements

This communication is based on work carried out as part of the TranStat project (Transitions to Sustainable Ski Tourism in the Alps of Tomorrow), coordinated by INRAE (Emmanuelle GEORGE) and funded by the Interreg program, Alpine Space, Priority 1, with a total budget of €2,223,167.

References

- Abel, N. et al. (2011) 'Sea level rise, coastal development and planned retreat: Analytical framework, governance principles and an Australian case study', *Environmental Science and Policy*, 14(3), pp. 279–288. Available at: <https://doi.org/10.1016/j.envsci.2010.12.002>.
- Achin, C. (2015) *La gouvernance de la diversification comme enjeu de l'adaptation des stations de moyenne montagne : L'analyse des stations de la Bresse, du Dévoluy et du Sancy*. Université Grenoble Alpes.
- Achin, C. and George-Marcelpoil, E. (2013) 'Sorties de piste pour la performance touristique des stations de sports d'hiver', 3.
- Adler, C. et al. (2023) 'Cross-Chapter Paper 5: Mountains', in *Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. 1st edn. Cambridge University Press. Available at: <https://doi.org/10.1017/9781009325844>.
- Alexander, E.R. (1992) 'A Transaction Cost Theory of Planning', *Journal of the American Planning Association*, 58(2), pp. 190–200. Available at: <https://doi.org/10.1080/01944369208975793>.
- Allmendinger, P. (2002) 'Towards a Post-Positivist Typology of Planning Theory', *Planning Theory*, 1(1), pp. 77–99. Available at: <https://doi.org/10.1177/147309520200100105>.

- Barnett, J. et al. (2015) 'From barriers to limits to climate change adaptation: Path dependency and the speed of change', *Ecology and Society*, 20(3). Available at: <https://doi.org/10.5751/ES-07698-200305>.
- Berard-Chenu, L. et al. (2021) 'Do changes in snow conditions have an impact on snowmaking investments in French Alps ski resorts?', *International Journal of Biometeorology*, 65(5), pp. 659–675. Available at: <https://doi.org/10.1007/s00484-020-01933-w>.
- Berard-Chenu, L., Métral, P.-A. and Cognard, J. (2024) "'Fin du ski" sous tension : chronique d'un renoncement au stade de neige de la Sambuy (Haute-Savoie, Bauges)', *Journal of Alpine Research | Revue de géographie alpine* [Preprint]. Available at: <https://doi.org/10.4000/11va5i>.
- Berrang-Ford, L. et al. (2021) 'A systematic global stocktake of evidence on human adaptation to climate change', *Nature Climate Change*, 11(11), pp. 989–1000. Available at: <https://doi.org/10.1038/s41558-021-01170-y>.
- Bonanomi, G. et al. (2024) 'Winter is coming for ski resorts: Insights from the Apennines (Italy)', *Journal of Mountain Science* [Preprint]. Available at: <https://doi.org/10.1007/s11629-023-8539-y>.
- Bourdeau, P. (2009) 'From après-ski to après-tourism: the Alps in transition?', *Revue de géographie alpine* [Preprint], (97–3). Available at: <https://doi.org/10.4000/rga.1054>.
- Bourdeau, P. (2012) 'Visiting/living (in) the Alps: towards a tourist-residential convergence?', in *WHOSE ALPS ARE THESE? Governance, ownerships and belongings in contemporary Alpine regions*. Padova University press, pp. 195–204.
- Bourdeau, P. (2021) 'Dilemmes de transition. Les destinations françaises de sports d'hiver entre agir créatif, inerties et maladaptation', *Géocarrefour*, 95(2). Available at: <https://doi.org/10.4000/geocarrefour.18943>.
- Brulle, R.J. and Norgaard, K.M. (2019) 'Avoiding cultural trauma: climate change and social inertia', *Environmental Politics*, 28(5), pp. 886–908. Available at: <https://doi.org/10.1080/09644016.2018.1562138>.
- Chambre régionale des comptes (2016) Rapport d'observations définitives et sa réponse : Commune de Saint-Pierre de Chartreuse (38).
- Chambre régionale des comptes (2023) LA STATION DE SAINT-PIERRE DE CHARTREUSE – LE PLANOLET | COMMUNAUTÉ DE COMMUNES CŒUR-DE-CHARTREUSE ET COMMUNE DE SAINT-PIERRE-DE-CHARTREUSE (Départements de l'Isère et de la Savoie): Les acteurs publics locaux du tourisme face au changement climatique en montagne. Synthèse.
- Chambre régionale des comptes (2024) Les acteurs publics locaux du tourisme face au changement climatique: Exercices 2016 et suivants. Synthèse.
- Cour de comptes (2024) Les stations de montagne face au changement climatique.
- Cumin, G. (1974) 'Les stations intégrées', *Urbanisme*.
- Damm, A., Köberl, J. and Prettenhaler, F. (2014) 'Does artificial snow production pay under future climate conditions?-A case study for a vulnerable ski area in Austria', *Tourism Management*, 43, pp. 8–21. Available at: <https://doi.org/10.1016/j.tourman.2014.01.009>.
- Dayon, G. et al. (2018) 'Impacts of climate change on the hydrological cycle over France and associated uncertainties', *Comptes Rendus. Géoscience*, 350(4), pp. 141–153. Available at: <https://doi.org/10.1016/j.crte.2018.03.001>.
- Dumont, M. et al. (2025) 'The European Alps in a changing climate: physical trends and impacts', *Comptes Rendus. Géoscience*, 357(G1), pp. 25–42. Available at: <https://doi.org/10.5802/crgeos.288>.
- FAO (2023) Temperature change statistics 1961–2022: Global, regional and country trends. Analytical Brief 63. New York: UN.
- François, H. et al. (2023) 'Climate change exacerbates snow-water-energy challenges for European ski tourism',

Nature Climate Change, 13(9), pp. 935–942. Available at: <https://doi.org/10.1038/s41558-023-01759-5>.

Garrelts, H. and Lange, H. (2011) 'Path dependencies and path change in complex fields of action: Climate adaptation policies in Germany in the realm of flood risk management', *Ambio*, 40(2), pp. 200–209. Available at: <https://doi.org/10.1007/s13280-010-0131-3>.

Gerbaux, M. et al. (2020) 'Snow Reliability and Water Availability for Snowmaking in the Ski resorts of the Isère Département (French Alps), Under Current and Future Climate Conditions', *Revue de géographie alpine*, (108–1), pp. 0–19. Available at: <https://doi.org/10.4000/rga.6742>.

Gill, A.M. and Williams, P.W. (2018) 'Transitioning towards sustainability in the mountain resort community of Whistler, British Columbia', *Tourism Recreation Research*, 43(4), pp. 528–539. Available at: <https://doi.org/10.1080/02508281.2018.1509828>.

Haasnoot, M. et al. (2020) 'Defining the solution space to accelerate climate change adaptation', *Regional Environmental Change*, 20(2), pp. 1–6. Available at: <https://doi.org/10.1007/s10113-020-01623-8>.

Hagimont, S. (2020) 'La nature, l'économie et l'imaginaire. L'aménagement touristique de la montagne (Pyrénées, fin du XVIII e siècle-1914)', *Revue d'histoire moderne & contemporaine*, n° 67-3(3), pp. 30–58. Available at: <https://doi.org/10.3917/rhmc.673.0032>.

Harries, T. and Penning-Rowsell, E. (2011) 'Victim pressure, institutional inertia and climate change adaptation: The case of flood risk', *Global Environmental Change*, 21(1), pp. 188–197. Available at: <https://doi.org/10.1016/j.gloenvcha.2010.09.002>.

Healey, P. (2003) 'Collaborative Planning in Perspective', *Planning Theory*, 2(2), pp. 101–123. Available at: <https://doi.org/10.1177/14730952030022002>.

INSEE (2023) Évolution et structure de la population en 2020 Commune de Saint-Pierre-de-Chartreuse (38442). Available at: https://www.insee.fr/fr/statistiques/7633058?geo=COM-38442#ancrage-POP_T1 (Accessed: 11 March 2025).

IPCC (2023) Synthesis Report of the IPCC Sixth Assessment Report (AR6).

Knowles, N.L.B. (2019) 'Can the North American ski industry attain climate resiliency? A modified Delphi survey on transformations towards sustainable tourism', *Journal of Sustainable Tourism*, 27(3), pp. 380–397. Available at: <https://doi.org/10.1080/09669582.2019.1585440>.

Lajarge, R. and Sadoux, S. (2023) 'La libération territoriale: Pistes pour les sciences territoriales, l'urbanisme et l'architecture', *Recherches anglaises et nord-américaines*, (57), pp. 148–167. Available at: <https://doi.org/10.4000/ranam.338>.

Mahoney, J. (2000) 'Path Dependence in Historical Sociology', *Theory*, 29(4), pp. 507–548.

Meng, M. et al. (2022) 'Spatial planning in the face of flood risk: Between inertia and transition', *Cities*, 126(May). Available at: <https://doi.org/10.1016/j.cities.2022.103702>.

Meynard, J.M. et al. (2018) 'Socio-technical lock-in hinders crop diversification in France', *Agronomy for Sustainable Development*, 38(5). Available at: <https://doi.org/10.1007/s13593-018-0535-1>.

Morin, S. et al. (2023) 'Simulated hydrological effects of grooming and snowmaking in a ski resort on the local water balance', *Hydrology and Earth System Sciences*, 27(23), pp. 4257–4277. Available at: <https://doi.org/10.5194/hess-27-4257-2023>.

Munck Af Rosenschöld, J., Rozema, J.G. and Frye-Levine, L.A. (2014) 'Institutional inertia and climate change: a review of the new institutional literature', *WIREs Climate Change*, 5(5), pp. 639–648. Available at: <https://doi.org/10.1002/wcc.292>.

- Pachoud, C., Koop, K. and George, E. (2022) 'Societal transformation through the prism of the concept of territoire: A French contribution', *Environmental Innovation and Societal Transitions*, 45(October), pp. 101–113. Available at: <https://doi.org/10.1016/j.eist.2022.10.001>.
- Pavoni, A., Pereira, L. and Tulumello, S. (2024) 'Planning (in) the Next Century? On the Futures of Planning That are Already Here', *Journal of Planning Literature*, p. 08854122241265115. Available at: <https://doi.org/10.1177/08854122241265115>.
- Perret, J. (1992) *Le développement touristique local: Les stations de sports d'hiver*. Université Pierre Mendès France de Grenoble.
- Rittel, H.W.J. and Webber, M.M. (1973) 'Dilemmas in a general theory of planning', *Policy Sciences*, 4(2), pp. 155–169.
- Robert, S., Quercy, A. and Schleyer-Lindenmann, A. (2023) 'Territorial inertia versus adaptation to climate change. When local authorities discuss coastal management in a French Mediterranean region', *Global Environmental Change*, 81(April), p. 102702. Available at: <https://doi.org/10.1016/j.gloenvcha.2023.102702>.
- Rouch, L., George, E. and Rieutort, L. (2022) 'Evolution of stakeholder networks along tourism diversification trajectories in mid-mountain areas: new forms of collaboration?', *Geographie Economie Societe*, 24(3–4), pp. 339–362. Available at: <https://doi.org/10.3166/ges.2022.0011>.
- Schlegel, S. and Schuck, C. (2024) 'Die another day: explanations based on qualitative comparative analysis (QCA) for the survival and non-survival of isolated ski lifts in Switzerland', *Geographica Helvetica*, 79(1), pp. 85–99. Available at: <https://doi.org/10.5194/gh-79-85-2024>.
- Scott, D., Knowles, N. and Steiger, R. (2024) 'Is snowmaking climate change maladaptation?', *Journal of Sustainable Tourism*, 32(2), pp. 282–303. Available at: <https://doi.org/10.1080/09669582.2022.2137729>.
- Shahab, S. (2022) 'Transaction Costs in Planning Literature: A Systematic Review', *Journal of Planning Literature*, 37(3), pp. 403–414. Available at: <https://doi.org/10.1177/08854122211062085>.
- Spandre, P. et al. (2019) 'Winter tourism under climate change in the Pyrenees and the French Alps: relevance of snowmaking as a technical adaptation', *The Cryosphere*, 13(4), pp. 1325–1347. Available at: <https://doi.org/10.5194/tc-13-1325-2019>.
- Steiger, R. et al. (2019) 'A critical review of climate change risk for ski tourism', *Current Issues in Tourism*, 22(11), pp. 1343–1379. Available at: <https://doi.org/10.1080/13683500.2017.1410110>.
- Steiger, R. et al. (2024) 'Impacts of climate change on mountain tourism: a review', *Journal of Sustainable Tourism*, 32(9), pp. 1984–2017. Available at: <https://doi.org/10.1080/09669582.2022.2112204>.
- Taylor, A. (2016) 'Institutional inertia in a changing climate: Climate adaptation planning in Cape Town, South Africa', *International Journal of Climate Change Strategies and Management*, 8(2), pp. 194–211. Available at: <https://doi.org/10.1108/IJCCSM-03-2014-0033>.
- Tewdwr-Jones, M. and Allmendinger, P. (eds) (2002) *Planning futures: new directions for planning theory*. London: Routledge.
- Vindevoghel, V. (2024) 'Rethinking the geography of sustainability transitions by considering human-nature connections in rural areas', *Environmental Innovation and Societal Transitions*, 51, p. 100851. Available at: <https://doi.org/10.1016/j.eist.2024.100851>.